

STATE OF NEW HAMPSHIRE  
DEPARTMENT OF HEALTH AND HUMAN SERVICES  
DIVISION OF PUBLIC HEALTH SERVICES



Nicholas A. Toumpas  
Commissioner

29 HAZEN DRIVE, CONCORD, NH 03301-6504  
603-271-5927 1-800-852-3345 Ext. 5927  
Fax: 603-271-0545 TDD Access: 1-800-735-2964

José T. Montero  
Director

ARBOVIRAL NEUROLOGICAL ILLNESS  
INFORMATION FOR CLINICIANS

**Background**

Arboviruses such as West Nile virus (WNV) and Eastern Equine Encephalitis (EEE) virus are transmitted to humans through the bite of an infected mosquito. The viruses are maintained in a bird-mosquito cycle with humans considered incidental hosts. The seasonality of arboviral transmission is variable and depends on the geographic location of exposure, the specific cycles of viral transmission, and local climatic conditions. The time of highest risk for human infection in NH has been identified between July and October. Year-round transmission is possible in some geographic locations in the U.S., therefore WNV or EEE should be considered in persons with consistent travel history.

Alternate modes of transmission for WNV, such as through blood transfusion and organ transplantation from infected donors, occupational sharps injury exposures, transplacental transmission, and probable transmission via breast milk have been documented.

Nationally, for the 2007 season, there were 3623 WNV human cases reported to the Centers for Disease Control and Prevention (CDC). **Neuroinvasive Disease** (cases of severe disease, specifically meningitis and encephalitis) was apparent in 1213 (33%) of these diagnosed cases, 2347 (65%) were diagnosed with West Nile fever (milder disease), and 63 (2%) were clinically unspecified. Between 1964 and 2007, 254 human cases of EEE were reported in the US, with an average of 5 cases per year. Several NH residents have been diagnosed with these diseases and likely acquired the disease locally in NH. In 2003, NH reported 3 human WNV cases. In 2005, NH reported 7 human EEE cases, which included 2 deaths. During 2007, 3 human EEE cases were reported.

Approximately 1 in 150 WNV infections will result in severe neurological disease with encephalitis being reported more commonly than meningitis. Approximately one-third of all people with clinical encephalitis caused by EEE virus will die from the disease. Of those who recover, many will suffer permanent brain damage with many of those requiring long-term institutional care. Severe neurological disease due to WNV and EEE virus has occurred in patients of all ages.

### **When to Suspect Arboviral Illness**

The incubation period following the bite of an infected mosquito ranges from 3 to 14 days and symptoms may last for several days to months or may even be life-long. Most arboviral infections are mild and often clinically unapparent. Mild forms of arboviral infection are described as a febrile illness of sudden onset often accompanied by headache, myalgias, arthralgias, which is sometimes accompanied by skin rash or lymphadenopathy. Approximately 20% of those infected with WNV develop a mild illness known as West Nile Fever.

Symptoms of arboviral infection occurring among patients hospitalized with severe neurological disease included fever, headache and altered mental status, ranging from confusion to coma, with or without additional signs of brain dysfunction. Less common neurological syndromes can include cranial and peripheral neuritis or other neuropathies, including acute flaccid paralysis syndrome. A minority of patient with severe disease develop a maculopapular or morbilliform rash involving the neck, trunk, arms, or legs. Although not observed in recent outbreaks, myocarditis, pancreatitis, and fulminant hepatitis have been described.

Laboratory findings among patients in recent outbreaks included normal or elevated total leukocyte counts, lymphocytopenia and anemia, and hyponatremia in peripheral blood. Examination of cerebrospinal fluid (CSF) showed pleocytosis (usually with a predominance of lymphocytes), elevated protein, and normal glucose levels. For about one-third of WNV patients, magnetic resonance imaging (MRI) showed enhancement of the leptomeninges, the periventricular areas, or both, while MRI of EEE patients often revealed abnormalities of the basal ganglia and thalami. See attached Submission Guidelines for Arboviral Testing for information on diagnostic testing.

Treatment is supportive, often involving hospitalization, intravenous fluids, respiratory support, and prevention of secondary infections for patients with severe disease.

For additional clinical information please refer to:

Deresiewicz, R., Scott, J., Thaler, Hsu, L., Zamani, A. 1997. Clinical and Neuroradiographic Manifestations of Eastern Equine Encephalitis. *The New England Journal of Medicine* 336:1867-1874.

Petersen, L., Marfin. A. 2002. West Nile virus: A Primer for the Clinician. *Annals of Internal Medicine* 137:173-9.

Sejvar, J. 2007. The Long-term Outcomes of Human West Nile virus Infection. *Clinical Infectious Diseases* 44:1617-24.

The Centers for Disease Control, Division of Vector-Borne Infectious Diseases website at: <http://www.cdc.gov/ncidod/dvbid/westnile/clinicians/>.

### **When to Report Suspected Cases of Arboviral Illness**

Clinicians, hospitals, and laboratories should report **within 24 hours** any patient meeting the following criteria.

1. Any patient with viral encephalitis, who meet criteria a, b and c below:
  - a. Fever  $\geq$  38.0 C or 100 F, and
  - b. CNS involvement including altered mental status (altered level of consciousness, confusion, agitation, lethargy) and/or other evidence of cortical involvement (e.g., focal neurologic findings, seizures), and
  - c. Abnormal CSF profile suggesting a viral etiology (a negative bacterial stain and culture with a pleocytosis [WBC between 5 and 1500 cells] and lymphocytopenia and/or an elevated protein level [ $> 40$  mg]), with or without criteria d.
  - d. Muscle weakness (especially flaccid paralysis) confirmed by neurologic exam or by EMG.
2. Any patient with presumptive aseptic meningitis. This includes symptoms of fever, headache, stiff neck and/or other meningeal signs along with laboratory evidence of CSF pleocytosis with predominant lymphocytes, moderately elevated protein, and a negative gram stain and culture.
3. Guillain-Barre syndrome, especially with atypical features, such as fever, altered mental status, and/or pleocytosis.

### **How to Report Suspect Cases of Arboviral Illness**

All suspect cases should first be reported to the New Hampshire Department of Health and Human Services (NHDHHS) by telephone. A completed case report form (enclosed) must be faxed to the NH Communicable Disease Control Section (603-271-0545) **and** a copy submitted with the laboratory specimen(s) to the NH Public Health Laboratories. Communicable Disease Control staff is available to help determine if the clinical presentation meets the case criteria for viral meningo-encephalitis and whether further testing would be appropriate. Our staff will then facilitate and assure the collection of acute and convalescent sera on all suspected case-patients. Specimen submission guidelines are enclosed.

**Diagnostic Testing Fee Schedule**

TEST	CPT
Eastern Equine Encephalitis (EEE) virus antibodies, IgM	86652
St. Louis Encephalitis (SLE) virus antibodies, IgM	86653
West Nile (WNV) virus antibodies, IgM	86788

All specimens submitted to the Public Health Laboratories will be screened for EEE, SLE, and WNV.

**The Total Cost Per Screen is \$105.00.**

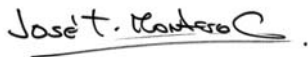
**Note: All spinal fluid submissions must be accompanied by a corresponding serum sample. There will be only a single charge for the paired specimens.**

Please feel free to contact the Communicable Disease Control Section if you have any questions. During business hours (8 am to 4:30 pm), call the Arboviral Surveillance Coordinator at 603-271-5927 or 1-800-852-2345, extension 5927. Nights or weekends call the New Hampshire Hospital switchboard at 1-800-852-3345, extension 5300 and request the Public Health Professional on-call.

For additional information on arboviral illness, including fact sheets and maps of recent activity, please visit the NHDHHS WNV/EEE website at <http://www.dhhs.state.nh.us/DHHS/CDCS/West+Nile+Virus/default.htm>. A toll free WNV/EEE information line is also available during the summer months. The phone number is 1-866-273-NILE (6453).

The success of our combined efforts will be due in large part to the rapid communication and cooperation between the medical and laboratory communities and NHDHHS. As always, we appreciate the ongoing partnership with the healthcare providers of New Hampshire in reporting and investigating unusual disease manifestations or clusters.

Sincerely,



José T. Montero, MD  
Director

Dianne Donovan, BSc  
Arboviral Surveillance Coordinator

Enclosures: NH Arboviral Case Report Form  
Submission Guidelines for Arboviral Testing